

MIL-R-27426A

1 May 1972

SUPERSEDING

MIL-R-27426

8 April 1960

MILITARY SPECIFICATION

**RINGS, RETAINING, SPIRAL
(UNIFORM CROSS SECTION)**

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

*1.1 Scope. This specification covers the procurement requirements for uniform cross section spiral retaining rings used on shafts and in bearing housings.

*1.2 Classification. Retaining rings shall conform to one of the following classifications and codes as specified (see 6.3).

Type A - External Ring

Class 1 - Light

Class 2 - Heavy

Type B - Internal Ring

Class 1 - Light

Class 2 - Heavy

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

SPECIFICATIONS

*Federal

QQ-C-533

Copper-Beryllium Alloy Strip (Copper Alloy
Numbers 170 and 172)

FSC 5365

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***Federal** (Continued)

*QQ-P-35 Passivation Treatments For Austenitic, Ferritic,
and Martensitic Corrosion-Resisting Steel
(Fastening Devices)

QQ-P-416 Plating, Cadmium (Electrodeposited)

***Military**

PPP-H-1581 Hardware (Fasteners and Related Items), Packaging
and Packing for Shipment and Storage of

MIL-S-5059 Steel, Corrosion-Resistant (18-8), Plate, Sheet
and Strip (ASG)

MIL-P-16232 Phosphate Coating, Heavy, Manganese or Zinc
Base (for Ferrous Metals)

MIL-S-46049 Steel, Carbon, Strip, Cold Rolled, Hardened and
Tempered, Spring Quality

STANDARDS

***Military**

MIL-STD-105 Sampling Procedures and Tables for Inspection by
Attributes

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

* 2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or requests for proposal shall apply.

American Society for Testing and Materials

ASTM E 18 Test for Rockwell Hardness of Metallic Materials

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.)

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3. REQUIREMENTS

*3.1 Materials. Material used in the manufacture of retaining rings shall be either carbon steel, corrosion-resisting steel, or copper-beryllium alloy as specified (see 6.3), conforming to 3.1.1, 3.1.2, or 3.1.3 as applicable.

*3.1.1 Carbon steel. Carbon steel used in the manufacture of retaining rings shall conform to the requirements of MIL-S-46049 (MR), AISI grade designations C1070 through C1090 inclusive.

NOTE

Standard material for all sizes.

*3.1.2 Corrosion-resisting steel. Corrosion-resisting steel used in the manufacture of retaining rings shall conform to the requirements of MIL-S-5059, AISI type 302.

NOTE

Optional material for rings which do not require a radial wall greater than .500 or a material thickness greater than .062.

*3.1.3 Copper-beryllium alloy. Copper-beryllium alloy used in the manufacture of retaining rings shall conform to QQ-C-533, alloy number 172.

NOTE

Special request material not recommended for rings over .065 material thickness.

*3.2 Physical requirements. Retaining rings shall conform to the physical requirements specified herein for the type, material, and size of ring specified (see 6.3).

*3.2.1 Carbon steel rings. Carbon steel retaining rings shall have a tensile strength and a hardness conforming to the following for the thickness indicated.

<u>Material thickness</u> <u>(minimum) (Inch)</u>	<u>Rockwell scale</u>	<u>Hardness</u>
to 0.0067	UTS in thousands of psi	255 - 305
0.0068 to 0.0141	15N	80 - 87.3
0.0142 to 0.0212	30N	60 - 71
0.0213 to 0.0432	A	71 - 77.5
0.0433 and over	C	40 - 51.5

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*3.2.2 Corrosion-resisting steel rings. Corrosion-resisting steel retaining rings shall have a hardness conforming to the following for the thickness indicated.

<u>Material thickness (minimum) (inch)</u>	<u>Rockwell scale</u>	<u>Hardness</u>
0.008 to 0.015	15N	83.0 - 86
0.016 to 0.022	30N	64.0 - 69.5
0.023 to 0.047	A	72.0 - 74.9
0.048 to 0.062	C	39.8 - 48.5

*3.2.3 Copper-beryllium alloy rings. Copper-beryllium alloy retaining rings shall have a hardness of 55 to 61 Rockwell 30N scale, or equivalent, as required for material thickness.

3.3 Protective finish.

*3.3.1 Cadmium plating. Cadmium plating shall be in accordance with QQ-P-416, Type II, Class 2.

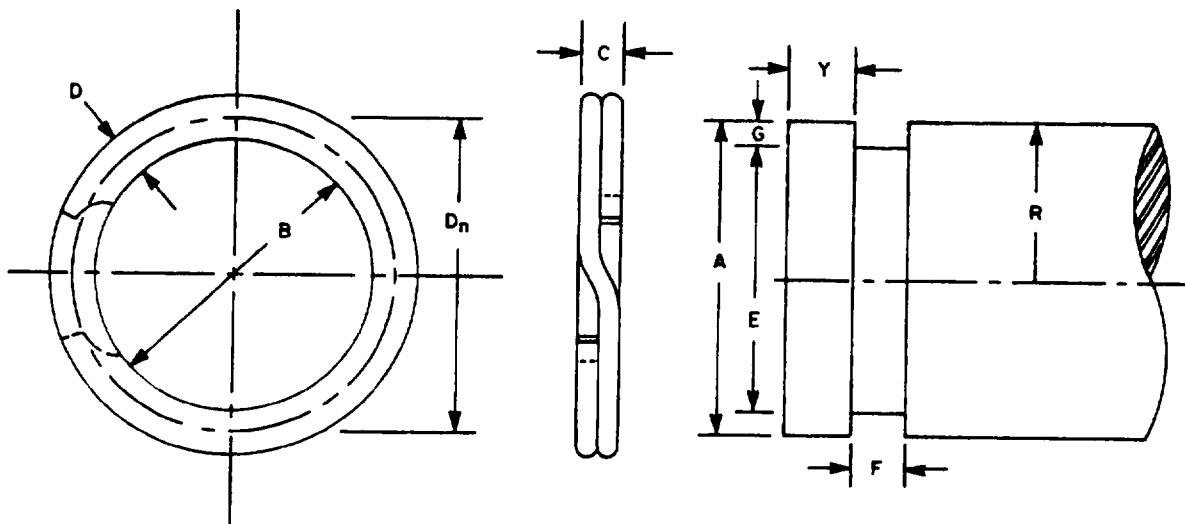
3.3.2 Phosphate coating. Phosphate coating shall be in accordance with MIL-P-16232, Type Z, Class 2.

*3.3.3 Passivation. Corrosion-resisting steel rings shall be passivated in accordance with QQ-P-35.

*3.4 Design. The design, shape, mechanical requirements, and dimensions of retaining rings furnished under this specification shall conform to all the requirements specified herein for the applicable type, class, and size of ring. When specified in contract or order, the rings may be furnished in the open position.

*3.4.1 Type A, Classes 1 and 2 rings. Type A, Class 1 rings and Type A, Class 2 rings shall be similar to Figure 1 and shall conform to the dimensions and tolerances specified in Tables I and II respectively, and to other applicable dimensions and tolerances specified herein. Ring thickness applies only to unplated rings. Add 0.002 to listed thickness for plated rings. Groove widths listed will accept plated rings without modification.

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Maximum bottom groove radius is 0.005 in for ring up to 0.946 in free dia. and 0.010 in for larger rings.

Figure 1. Type A, (External Ring)

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*Table I

TYPE A, CLASS I RETAINING RINGS

Dash no.	A SHAFT DIAMETER		RING DIMENSIONS			GROOVE DIMENSIONS		
	Inches	mm	Free Diameter B	Thickness C	Radial Wall D	Diameter E	Width F	Nominal Groove Depth G
100	.500	12.7	.467	.025	.045	.474	.030	.014
101	.531	13.5	.498	.025	.045	.505	.030	.014
102	.551	14.0	.518	.025	.045	.525 ± .002	.030	.014
103	.562	14.3	.529	.025	.045	.536	.030	.014
104	.594	15.1	.561	.025	.045	.569	.030	.014
105	.625	15.9	.585	.025	.055	.594	.030	.017
106	.656	16.7	.617	.025	.055	.625	.030	.017
107	.669	17.0	.629	.025	.055	.638	.030	.017
108	.687	17.5	.647	.025	.055	.656	.030	.017
109	.718	18.3	.679 ± .000 .013	.025	.055	.687	.030	.017
110	.750	19.0	.710	.031	.065	.719	.036	.017
111	.781	19.8	.741	.031	.065	.750	.036	.017
112	.812	20.6	.771	.031	.065	.781 ± .003	.036	.017
113	.843	21.4	.803	.031	.065	.812	.036 ± .003	.017
114	.875	22.2	.828	.031	.065 ± .003	.838	.036 ± .000	.020
115	.906	23.0	.860	.031	.065 ± .005	.869	.036	.020
116	.937	23.8	.889	.031	.065	.900	.036	.020
117	.968	24.4	.916	.037	.075	.925	.042	.023
118	.984	25.0	.930	.037	.075	.941	.042	.023
119	1.000	25.4	.946	.037 ± .002	.075	.957	.042	.023
120	1.023	26.0	.968	.037	.075	.980	.042	.023
121	1.031	26.3	.978	.037	.075	.986	.042	.023
122	1.062	27.0	1.007	.037	.075	1.020	.042	.023
123	1.083	27.8	1.040	.037	.075	1.051	.042	.023
124	1.125	29.0	1.070	.037	.075	1.083	.042	.023
125	1.156	29.3	1.102	.037	.075	1.114	.042	.023
126	1.188	30.2	1.127	.043	.085	1.140	.048	.026
127	1.218	31.0	1.159	.043	.085	1.170	.048	.026
128	1.250	31.7	1.188 ± .000	.043	.085	1.202	.048	.026
129	1.281	32.6	1.221 ± .015	.043	.085	1.233 ± .004	.048	.026
130	1.312	33.3	1.251	.043	.095	1.264	.048	.026
131	1.343	34.1	1.282	.043	.095	1.295	.048	.026
132	1.375	34.9	1.308	.043	.095	1.323	.048	.028
133	1.406	35.8	1.340	.043	.095	1.354	.048	.028
134	1.437	36.5	1.370	.043	.095	1.385	.048	.028
135	1.468	37.3	1.402	.043	.095	1.416	.048	.028
136	1.500	38.1	1.433	.043	.095	1.448	.048	.028
137	1.562	39.6	1.490	.049	.108	1.507	.056 ± .004	.030
138	1.575	40.0	1.503	.049	.108	1.520	.056 ± .000	.030
139	1.625	41.7	1.549	.049	.108	1.566	.056	.032
140	1.687	42.8	1.610 ± .000	.049	.118	1.628	.056	.032
141	1.750	44.4	1.673 ± .020	.049 ± .003	.118	1.691 ± .005	.056	.032
142	1.771	44.9	1.690	.049	.118	1.706	.056	.034
143	1.813	46.0	1.730	.049	.118	1.749	.056	.034
144	1.875	47.6	1.789	.049	.128	1.808	.056	.036

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*Table 1 (Continued)

Dash no.	A SHAFT DIAMETER		RING DIMENSIONS			GROOVE DIMENSIONS		
	Inches	mm	Free Diameter B	Thickness C	Radial Wall D	Diameter E	Width F	Nominal Groove Depth G
145	1.938	49.2	1.844	.049	.128	1.861	.056	.036
146	1.969	50.0	1.882	.049	.128	1.902 + .005	.056 + .004	.036
147	2.000	50.8	1.909 + .000	.049 + .003	.128	1.929	.056 - .000	.038
148	2.082	52.3	1.971 - .020	.049	.128	1.992	.056	.038
149	2.125	53.9	2.029	.049	.128	2.051	.056	.040
150	2.156	54.7	2.060	.049	.138	2.082	.056	.040
151	2.165	55.0	2.070	.049	.138	2.091	.056	.040
152	2.188	55.5	2.092	.049	.138	2.113	.056	.040
153	2.250	57.1	2.153 + .000	.049	.138	2.176	.056	.040
154	2.312	58.7	2.211 - .025	.049	.138	2.234	.056	.042
155	2.362	59.9	2.261	.049	.138 + .003	2.284	.056	.042
156	2.375	60.3	2.273	.049	.138 - .005	2.297	.056	.042
157	2.437	61.9	2.331	.049	.148	2.355	.056	.044
158	2.500	63.5	2.394	.049	.148	2.418	.056 + .004	.044
159	2.559	64.9	2.449	.049	.148	2.473	.056 - .000	.046
160	2.582	65.1	2.452	.049	.148	2.476	.056	.046
161	2.625	66.6	2.514	.049	.148	2.539	.056	.046
162	2.688	68.2	2.572	.049	.158	2.597	.056	.048
163	2.750	69.8	2.635	.049	.158	2.660	.056	.048
164	2.813	71.4	2.696	.049	.168	2.722	.056	.048
165	2.875	73.0	2.755	.049	.168	2.781	.056	.050
166	2.937	74.5	2.817	.049	.168	2.843	.056	.050
167	2.962	74.9	2.831	.049	.168	2.858	.056	.050
168	3.000	76.1	2.877 + .000	.061	.168	2.904	.068	.051
169	3.062	77.7	2.938 - .030	.061	.168	2.966	.068	.051
170	3.125	79.3	3.000	.061	.178	3.027	.068	.052
171	3.149	79.9	3.023	.061	.178	3.051	.068	.052
172	3.187	81.0	3.061	.061	.178	3.089	.068	.052
173	3.250	82.5	3.121	.061	.178	3.150	.068	.053
174	3.312	84.4	3.180	.061	.188	3.208	.068	.055
175	3.343	84.9	3.210	.061 ± .003	.188	3.239	.068	.055
176	3.375	85.8	3.242	.061	.188	3.271	.068	.055
177	3.437	87.2	3.301	.061	.188	3.331 ± .006	.068	.056
178	3.500	88.8	3.363	.061	.188	3.394	.068	.056
179	3.543	89.9	3.402	.061	.198	3.433	.068	.058
180	3.582	90.5	3.422	.061	.198 + .004	3.452	.068	.058
181	3.625	92.0	3.483	.061	.198	3.515	.068	.058
182	3.687	93.6	3.543	.061	.198 - .006	3.575	.068	.059
183	3.740	95.0	3.597	.061	.198	3.628	.068	.059
184	3.750	95.2	3.606	.061	.198	3.638	.068	.059
185	3.812	97.1	3.668 + .000	.061	.198	3.700	.068	.059
186	3.875	98.3	3.724 - .040	.061	.208	3.757	.068	.062
187	3.938	99.9	3.784	.061	.208	3.820	.068 + .005	.062
188	4.000	101.6	3.842	.061	.218	3.878	.068 - .000	.065
189	4.063	103.2	3.906	.061	.218	3.939	.068	.065
190	4.125	104.8	3.967	.061	.218	4.000	.068	.065
191	4.134	105.0	3.975	.061	.218	4.010	.068	.065
192	4.188	106.5	4.030	.061	.218	4.058	.068	.065
193	4.250	107.9	4.084	.061	.228	4.120	.068	.068
194	4.312	109.5	4.147	.061	.228	4.182	.068	.068

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*Table I (Continued)

Dash no.	A SHAFT DIAMETER		RING DIMENSIONS			GROOVE DIMENSIONS		
	Inches	mm	Free Diameter B	Thickness C	Radial Wall D	Diameter E	Width F	Nominal
								Groove Depth G
195	4.331	110.0	4.164	.061	.228	4.200	.068	.068
196	4.375	111.0	4.208	.061 + .003	.228	4.245	.068	.068
197	4.437	112.7	4.271	.061	.228	4.307	.068	.068
198	4.500	114.2	4.326	.061	.236	4.364	.068	.071
199	4.562	116.0	4.384	.072	.250	4.422	.079	.073
200	4.625	117.4	4.447	.072	.250	4.485	.079	.073
201	4.687	119.0	4.508	.072	.250	4.547	.079	.073
202	4.724	120.0	4.546	.072	.250	4.584 + .006	.079	.073
203	4.750	120.6	4.571	.072	.250	4.610	.079	.073
204	4.812	122.2	4.633	.072	.250	4.672	.079	.073
205	4.875	123.8	4.695	.072	.250	4.735	.079	.073
206	4.937	125.4	4.747 + .000	.072	.250	4.797	.079	.073
207	5.000	126.9	4.820 - .040	.072	.250	4.856	.079	.075
208	5.118	130.0	4.934	.072	.250	4.974	.079	.075
209	5.125	130.1	4.939	.072	.250	4.981	.079	.075
210	5.250	133.2	5.064	.072	.250 + .004	5.107	.079 + .005	.075
211	5.375	136.5	5.187	.072	.250 - .006	5.228	.079 - .000	.077
212	5.550	139.9	5.308	.072	.250	5.353	.079	.077
213	5.611	140.0	5.320	.072	.250	5.364	.079	.077
214	5.625	142.8	5.438	.072	.250	5.478 + .007	.079	.077
215	5.750	145.9	5.550 - .050	.072	.250	5.597	.079	.080
216	5.875	149.2	5.674	.072	.250	5.722	.079	.080
217	5.905	150.0	5.705	.072	.250	5.752	.079	.080
218	6.000	152.3	5.798	.072	.250	5.847	.079	.080
219	6.125	155.6	5.903	.086	.312	5.953	.084	.090
220	6.250	158.8	6.026	.086	.312	6.078	.084	.090
221	6.299	160.0	6.076	.086	.312	6.127	.084	.090
222	6.375	162.0	6.152	.086	.312	6.203	.084	.090
223	6.500	165.1	6.274	.086	.312	6.328	.084	.090
224	6.625	168.3	6.390	.086	.312	6.443	.084	.095
225	6.750	171.4	6.513 - .060	.086	.312	6.568	.084	.095
226	6.875	174.6	6.638	.086 + .004	.312	6.693	.084	.095
227	7.000	177.8	6.761	.086	.312	6.818	.084	.095
228	7.125	181.0	6.877	.086	.312	6.933	.084	.100
229	7.250	184.1	6.999	.086	.312	7.058	.084	.100
230	7.375	187.3	7.125	.086	.312 + .004	7.183	.084	.100
231	7.500	190.5	7.250	.086	.312	7.306	.084	.100
232	7.625	193.7	7.363	.086	.312 - .008	7.423	.084	.105
233	7.750	196.8	7.486	.086	.312	7.548	.084 + .006	.105
234	7.875	200.0	7.611	.086	.312	7.673 + .008	.084 - .000	.105
235	8.000	203.0	7.734	.086	.312	7.798	.084	.105
236	8.250	209.5	7.972	.086	.375	8.038	.084	.110
237	8.500	215.0	8.220	.086	.375	8.286	.084	.110
238	8.750	222.2	8.459	.086	.375	8.528	.084	.115
239	9.000	228.6	8.707	.086	.375	8.778	.084	.115
240	9.250	235.0	8.945 - .070	.086	.375	9.018	.084	.120
241	9.500	241.0	9.194	.086	.375	9.268	.084	.120
242	9.750	247.8	9.432	.086	.375	9.508	.084	.125
243	10.000	254.0	9.680	.086	.375	9.756	.084	.125
244	10.250	260.7	9.918	.086	.375	9.998	.084	.130
245	10.500	265.0	10.166	.086	.375	10.248	.084	.130
246	10.750	273.0	10.405	.086	.375	10.488	.084	.135
247	11.000	279.0	10.653	.086	.375	10.738	.084	.135

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*Table II

TYPE A, CLASS 2 RETAINING RINGS

Dash no.	A SHAFT DIAMETER		RING DIMENSIONS			GROOVE DIMENSIONS		
	Inches	mm	Free Diameter B	Thickness C	Radial Wall D	Diameter E	Width F	Nominal Groove Depth G
100	.469	11.9	.439	.025	.045	.443	.029	.013
101	.500	12.7	.464	.035	.050	.468 ± .002	.039	.016
102	.551	14.0	.514	.035	.050	.519	.039	.016
103	.562	14.3	.525	.035	.050	.530	.039	.016
104	.594	15.1	.554	.035	.050	.559	.039	.017
105	.625	15.9	.583	.035	.055	.588	.039	.018
106	.669	17.0	.623	.035	.055	.629	.039	.020
107	.688	17.5	.641	.042	.065	.646	.046 ± .003	.021
108	.750	19.0	.698	.042	.065	.704	.046 ± .000	.023
109	.781	19.8	.727	.042	.065	.733 ± .003	.046	.024
110	.812	20.6	.756 ± .000	.042 ± .002	.065	.762	.046	.025
111	.875	22.2	.814 ± .013	.042	.075	.821	.046	.027
112	.938	23.8	.876	.042	.075	.882	.046	.028
113	.984	25.0	.919	.042	.085	.926	.046	.029
114	1.000	25.4	.932	.042	.085	.940	.046	.030
115	1.023	26.0	.953	.042	.085 ± .003	.961	.046	.031
116	1.062	27.0	.986	.050	.103 ± .005	.998	.056	.032
117	1.125	28.0	1.047	.050	.103	1.059	.056	.033
118	1.168	30.2	1.105	.050	.103	1.118	.056	.035
119	1.250	31.7	1.163	.050	.103	1.176 ± .004	.056	.037
120	1.312	33.3	1.218	.050	.118	1.232	.056	.040
121	1.375	34.9	1.277	.050	.118	1.291	.056	.042
122	1.438	36.5	1.336	.050	.118	1.350	.056	.044
123	1.500	38.1	1.385	.050	.118	1.406	.056	.047
124	1.562	39.6	1.453	.062	.128	1.468	.068 ± .004	.047
125	1.625	41.7	1.513	.062	.128	1.529	.068	.048
126	1.687	42.8	1.573	.062	.128	1.589	.068	.049
127	1.750	44.4	1.633 ± .000	.062	.128	1.650	.068	.050
128	1.771	44.9	1.651 ± .020	.062	.128	1.669 ± .005	.068	.051
129	1.812	46.0	1.690	.062	.128	1.708	.068	.052
130	1.875	47.6	1.751	.062	.158	1.769	.068	.053
131	1.969	50.0	1.838	.062	.158	1.857	.068	.056
132	2.000	50.8	1.867	.062	.158	1.886	.068	.057
133	2.062	52.3	1.932	.078 ± .003	.168	1.946	.086	.058
134	2.125	53.9	1.989	.078	.168	2.003	.086	.061
135	2.156	54.7	2.018	.078	.168	2.032	.086	.062
136	2.250	57.1	2.106	.078	.168	2.120	.086	.065
137	2.312	58.7	2.163 ± .000	.078	.168	2.178	.086	.067
138	2.375	60.3	2.223 ± .025	.078	.200	2.239 ± .006	.086 ± .005	.068
139	2.437	61.9	2.283	.078	.200	2.299	.086 ± .000	.069
140	2.500	63.5	2.343	.078	.200 ± .004	2.360	.086	.070
141	2.559	64.9	2.402	.078	.200	2.419	.086	.070
142	2.625	66.6	2.464	.078	.200 ± .006	2.481	.086	.072
143	2.687	68.2	2.523	.078	.200	2.541	.086	.073
144	2.750	69.8	2.584	.093	.225	2.602	.103	.074
145	2.875	73.0	2.702	.093	.225	2.721	.103	.077
146	2.937	74.5	2.760 ± .000	.093	.225	2.779	.103	.079
147	3.000	76.1	2.818 ± .030	.093	.225	2.838	.103	.081
148	3.062	77.7	2.878	.093	.225	2.898	.103	.082
149	3.125	79.3	2.936	.093	.225	2.957	.103	.084

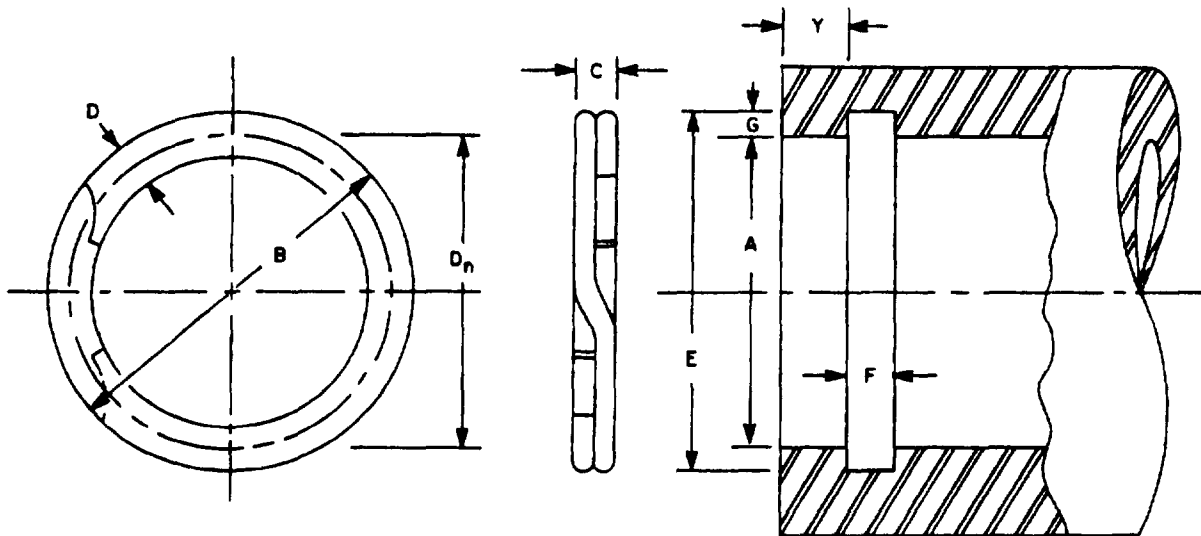
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*Table II (continued)

Dash no.	A SHAFT DIAMETER		RING DIMENSIONS			GROOVE DIMENSIONS		
	Inches	mm	Free Diameter B	Thickness C	Radial Wall D	Diameter F	Width F	Nominal Groove Depth G
150	3.156	80.1	2.965	.093	.225	2.986	.103	.085
151	3.250	82.5	3.054 + .000	.093	.225	3.076	.103	.087
152	3.344	84.9	3.144 - .030	.093	.225	3.166	.103	.090
153	3.437	87.2	3.234	.093	.225	3.257	.103	.090
154	3.500	88.8	3.293	.111	.270	3.316	.120	.092
155	3.543	89.9	3.333	.111 + .003	.270	3.357	.120	.093
156	3.625	92.0	3.411	.111	.270	3.435 + .006	.120 + .005	.095
157	3.687	93.6	3.469	.111	.270 + 0.004	3.493	.120 - .000	.097
158	3.750	95.2	3.527	.111	.270	3.552	.120	.099
159	3.875	98.3	3.647	.111	.270	3.673	.120	.101
160	3.938	99.9	3.708 - .035	.111	.270	3.734	.120	.102
161	4.000	101.5	3.765	.111	.270	3.792	.120	.104
162	4.250	107.9	4.037	.111	.270	4.065	.120	.092
163	4.375	110.0	4.161	.111	.270	4.190	.120	.092
164	4.500	114.2	4.280	.111	.270	4.310	.120	.095
165	4.750	120.6	4.518	.111	.270	4.550	.120	.100
166	5.000	126.9	4.758	.111	.270	4.790	.120	.105
167	5.250	133.2	4.995	.217	.350	5.030	.139	.110
168	5.500	140.0	5.225 + .000	.127 + .004	.350	5.265 + .007	.139 + .006	.117
169	5.750	145.9	5.466 - .050	.127	.350	5.505	.139 - .000	.122
170	6.000	152.3	5.705	.127	.350	5.745	.139	.127
171	6.250	158.6	5.938	.156	.418 - 0.008	5.985	.174	.132
172	6.500	165.0	6.181	.156	.418	6.225	.174	.137
173	6.750	171.3	6.410 + .000	.156	.418	6.465	.174	.142
174	7.000	177.7	6.648 - .060	.156	.418	6.705	.174	.147
175	7.250	184.0	6.891	.156	.437	6.942	.174	.154
176	7.500	190.4	7.130	.187	.437	7.180	.209	.160
177	7.750	196.8	7.368	.187	.437	7.420	.209	.165
178	8.000	203.0	7.606	.187	.437	7.660	.209	.170
179	8.250	209.8	7.845	.187	.437	7.900 + .008	.209	.175
180	8.500	215.7	8.083 + .000	.187	.437	8.140	.209	.180
181	8.750	222.2	8.324 - .070	.187	.437	8.383	.209	.182
182	9.000	228.4	8.560	.187	.500 + 0.006	8.620	.209	.190
183	9.250	235.0	8.8798	.187	.500	8.860	.209	.185
184	9.500	241.1	9.036	.187	.500 - 0.008	9.100	.209	.200
185	9.750	248.0	9.275	.187	.500	9.338	.209	.206
186	10.000	253.8	9.508	.187	.500	9.575	.209 + .008	.212
187	10.250	260.4	9.745	.187 + .005	.500	9.814	.209 - .000	.218
188	10.500	266.7	9.984	.187	.500	10.054	.209	.223
189	10.750	273.1	10.221	.187	.500	10.293	.209	.228
190	11.000	279.4	10.549 + .000	.187	.500	10.533	.209	.238
191	11.250	285.8	10.692 - .090	.187	.500	10.772	.209	.239
192	11.500	292.1	10.934	.187	.562	11.011 - .010	.209	.244
193	11.750	298.5	11.171	.187	.562	11.250	.209	.250
194	12.000	304.8	11.410	.187	.562	11.490	.209	.255
195	12.250	311.2	11.647	.187	.562	11.729	.209	.260
196	12.500	317.5	11.885	.187	.562	11.969	.209	.265
197	12.750	323.9	12.124	.187	.562	12.208	.209	.271
198	13.000	330.2	12.361	.187	.662	12.448	.209	.276
199	13.250	336.6	12.598	.187	.662	12.687	.209	.281
200	13.500	342.9	12.837 + .000	.187	.662	12.927	.209	.286
201	13.750	349.3	13.074 - .110	.187	.662	13.166	.209	.292
202	14.000	355.6	13.311	.187	.662	13.405 - .012	.209	.297
203	14.250	362.0	13.548	.187	.662	13.644	.209	.303
204	14.500	368.3	13.787	.187	.750	13.884	.209	.308
205	14.750	374.7	14.124	.187	.750	14.123	.209	.313
206	15.000	381.0	14.262	.187	.750	14.363	.209	.318

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3.4.2 Type B, Classes 1 and 2 rings. Type B, Class 1 rings and Type B, Class 2 rings shall be similar to Figure 2, and shall conform to the dimensions and tolerances specified in Tables III and IV, respectively, and to other applicable dimensions and tolerances specified herein. Ring thicknesses apply only to unplated rings. Add 0.002 inch to listed thickness for plated rings. Groove widths listed will accept plated rings without modification.



Maximum bottom groove radius is 0.005 in. for ring up to 1.063 in free dia. and 0.01 in. for larger rings.

Figure 2. Type B, (Internal Ring)

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*Table ID

TYPE B, CLASS 1 RETAINING RINGS

Dash no.	A HOUSING DIAMETER		RING DIMENSIONS			GROOVE DIMENSIONS		
	Inches	mm	Free Diameter B	Thickness C	Radial Wall D	Diameter E	Width F	Nominal Groove Depth G
100	.500	12.7	.532	.025	.045	.526	.030	.014
101	.512	13.0	.544	.025	.045	.538	.030	.014
102	.531	13.5	.564	.025	.045	.557	.030	.014
103	.562	14.3	.594	.025	.045	.584	.030	.014
104	.594	15.1	.626	.025	.045	.619	.030	.014
105	.625	15.9	.658	.025	.045	.651 ± .002	.030	.014
106	.656	16.7	.689	.025	.045	.682	.030	.014
107	.687	17.5	.720	.025	.045	.713	.030	.014
108	.718	18.3	.751	.025	.045	.744	.030	.014
109	.750	19.0	.790	.031	.065	.782	.036	.017
110	.777	19.7	.817 ± .013	.031	.065	.808	.036	.017
111	.781	19.8	.821 - .000	.031	.065	.812	.036	.017
112	.812	20.6	.853	.031	.065	.843	.036	.017
113	.843	21.4	.889	.031	.065	.880	.036	.020
114	.866	22.0	.913	.031	.065	.903	.036 ± .003	.020
115	.875	22.2	.922	.031	.065	.912	.036	.020
116	.906	22.9	.949	.031	.065	.938 ± .003	.036	.020
117	.938	23.8	.986	.031	.065	.975	.036	.020
118	.968	24.4	1.025	.037	.075	1.015	.042	.025
119	.987	25.0	1.041	.037	.075	1.030	.042	.023
120	1.000	25.4	1.054	.037 ± .002	.075	1.043	.042	.023
121	1.023	26.0	1.078	.037	.075	1.066	.042	.023
122	1.031	26.3	1.084	.037	.075 - 0.005	1.074	.042	.023
123	1.062	27.0	1.117	.037	.075	1.104	.042	.023
124	1.093	29.0	1.147	.037	.075	1.135	.042	.023
125	1.125	28.6	1.180	.037	.075	1.167	.042	.023
126	1.156	29.3	1.210	.037	.075	1.198	.042	.023
127	1.186	30.2	1.249	.043	.085	1.236	.048	.026
128	1.218	31.0	1.278 ± .015	.043	.085	1.266	.048	.026
129	1.250	31.7	1.312 - .000	.043	.085	1.298	.048	.026
130	1.281	32.6	1.342	.043	.085	1.329 ± .004	.048	.026
131	1.312	33.3	1.374	.043	.085	1.360	.048	.026
132	1.343	34.1	1.408	.043	.085	1.395	.048	.026
133	1.375	34.9	1.442	.043	.095	1.427	.048	.028
134	1.406	35.8	1.472	.043	.095	1.458	.048	.028
135	1.437	36.5	1.504	.043	.095	1.489	.048	.028
136	1.466	37.0	1.523	.043	.095	1.508	.048 ± .004	.028
137	1.468	37.3	1.535	.043	.095	1.520	.048 - .000	.028
138	1.500	38.1	1.567	.043	.095	1.552	.048	.028
139	1.562	39.6	1.634	.049	.108	1.617	.056	.032
140	1.574	40.0	1.649	.049	.108	1.633	.056	.032
141	1.625	41.7	1.701	.049	.108	1.684	.056	.032
142	1.653	42.0	1.730	.049	.108	1.712	.056	.032
143	1.687	42.8	1.768	.049	.118	1.750	.056	.034
144	1.750	44.4	1.834	.049 ± .003	.118	1.813 ± .005	.056	.034
145	1.813	46.0	1.894 ± .020	.049	.118	1.875	.056	.034
146	1.850	47.0	1.937 - .000	.049	.118	1.917	.056	.036
147	1.875	47.6	1.960	.049	.118	1.942	.056	.036
148	1.938	49.2	2.025	.049	.118	2.005	.056	.036
149	2.000	50.8	2.091	.049	.128	2.071	.056	.038

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*Table III (Continued)

Dash no.	A HOUSING DIAMETER		RING DIMENSIONS			GROOVE DIMENSIONS		
	Inches	mm	Free Diameter B	Thickness C	Radial Wall D	Diameter E	Width F	Nominal Groove Depth G
150	2.047	52.0	2.138 + .020 - .000	.049	.128	2.118 + .005	.056	.038
151	2.062	52.3	2.154	.049	.128	2.132	.056	.038
152	2.125	53.9	2.217	.049	.128	2.195	.056	.038
153	2.185	55.0	2.260	.049	.138	2.239	.056	.040
154	2.186	55.5	2.264	.049	.138	2.262	.056	.040
155	2.250	57.1	2.347	.049	.138	2.324	.056	.040
156	2.312	58.7	2.403	.049	.138	2.390	.056	.042
157	2.375	60.3	2.476	.049	.138 + 0.003	2.453	.056	.042
158	2.437	61.9	2.543	.049	.148	2.519	.056	.044
159	2.440	62.0	2.546	.049	.148 - 0.005	2.522	.056	.044
160	2.500	63.5	2.606 + .025	.049	.148	2.582	.056 + .004	.044
161	2.531	64.2	2.641 - .000	.049	.148	2.617	.056 - .000	.046
162	2.562	65.1	2.673	.049	.148	2.648	.056	.046
163	2.625	66.6	2.736	.049	.148	2.711	.056	.046
164	2.677	68.0	2.789	.049	.158	2.767	.056	.048
165	2.688	68.2	2.803	.049	.158	2.778	.056	.048
166	2.750	69.8	2.865	.049	.158	2.841	.056	.048
167	2.813	71.4	2.929	.049	.158	2.903	.056	.048
168	2.834	71.9	2.954	.049	.168	2.928	.056	.050
169	2.875	73.0	2.995	.049	.168	2.969	.056	.050
170	2.937	74.5	3.058	.049	.168	3.031	.056	.050
171	2.952	75.0	3.073	.049 ± .003	.168	3.046	.056	.050
172	3.000	76.1	3.122	.061	.168	3.096	.068	.051
173	3.062	77.7	3.186	.061	.168	3.158	.068	.051
174	3.125	79.3	3.251	.061	.178	3.223	.068	.052
175	3.149	80.0	3.276	.061	.178	3.247	.068	.052
176	3.187	81.0	3.311	.061	.178	3.283	.068	.052
177	3.250	82.5	3.379	.061	.178	3.350	.068	.053
178	3.312	84.4	3.446	.061	.188	3.416	.068	.055
179	3.346	84.9	3.479	.061	.188 + 0.004	3.450	.068	.055
180	3.375	85.0	3.509	.061	.188	3.479	.068	.055
181	3.437	87.2	3.574 + .030	.061	.188 - 0.006	3.543 ± .006	.068	.056
182	3.500	88.8	3.636 - .000	.061	.188	3.606	.068	.056
183	3.543	89.9	3.684	.061	.198	3.653	.068	.058
184	3.562	90.5	3.703	.061	.198	3.672	.068	.058
185	3.625	92.0	3.769	.061	.198	3.737	.068	.059
186	3.687	93.6	3.832	.061	.198	3.799	.068	.059
187	3.740	95.0	3.885	.061	.198	3.852	.068	.059
188	3.750	95.2	3.894	.061	.198	3.862	.068 + .005	.069
189	3.812	96.7	3.963	.061	.208	3.930	.068 - .000	.062
190	3.875	98.3	4.025	.061	.208	3.993	.068	.062
191	3.938	99.9	4.089	.061	.208	4.056	.068	.062
192	4.000	101.5	4.157	.061	.218	4.124	.068	.065
193	4.063	103.2	4.222	.061	.218	4.187	.068	.065
194	4.125	104.8	4.284	.061	.218	4.187	.068	.065
195	4.188	106.5	4.347	.061	.218	4.311	.068	.065
196	4.250	107.9	4.416	.061	.228	4.380	.068	.068
197	4.312	109.7	4.479	.061	.228	4.442	.068	.068
198	4.330	109.9	4.497 + .035	.061	.228	4.460	.068	.068
199	4.375	111.0	4.543 - .000	.061	.228	4.505	.068	.068
200	4.437	112.7	4.611	.061	.238	4.573	.068	.071
201	4.500	114.2	4.674	.061	.238	4.636	.068	.071
202	4.527	115.0	4.701	.061	.238	4.663	.068	.071
203	4.562	116.0	4.737	.061	.238	4.698	.068	.071
204	4.625	117.4	4.803	.072 ± .004	.250	4.765	.079	.073

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*Table III (Continued)

Dash no.	A HOUSING DIAMETER		RING DIMENSIONS			GROOVE DIMENSIONS		
	Inches	mm	Free Diameter B	Thickness C	Radial Wall D	Diameter E	Width F	Nominal Groove Depth G
205	4.687	119.0	4.867	.072	.250	4.827	.079	.073
206	4.724	120.0	4.903	.072	.250	4.864	.079	.073
207	4.750	120.6	4.930	.072	.250	4.890	.079	.073
208	4.812	122.2	4.993	.072	.250	4.952	.079	.073
209	4.875	123.8	5.055 + .035 - .000	.072	.250	5.015 + .006	.079	.073
210	4.921	125.0	5.102	.072	.250	5.061	.079	.073
211	4.937	125.4	5.122	.072	.250	5.081	.079	.075
212	5.000	126.9	5.185	.072	.250	5.144	.079	.075
213	5.118	129.9	5.304	.072	.250	5.262	.079	.075
214	5.125	130.1	5.311	.072	.250 + 0.004	5.289	.079 + .005 - .000	.075
215	5.250	133.2	5.436	.072	.250 - 0.006	5.393	.079	.075
216	5.375	136.5	5.566	.072	.250	5.522	.079	.077
217	5.500	139.9	5.693	.072	.250	5.647	.079	.077
218	5.511	139.9	5.703	.072	.250	5.656	.079	.077
219	5.625	142.8	5.818	.072	.250	5.772 ± .007	.079	.077
220	5.708	145.0	5.909 + .045	.072	.250	5.861	.079	.080
221	5.750	145.9	5.950 - .000	.072	.250	5.903	.079	.080
222	5.875	149.2	6.077	.072	.250	6.028	.079	.080
223	5.905	149.9	6.106	.072	.250	6.056	.079	.080
224	6.000	152.3	6.202	.072	.250	6.153	.079	.080
225	6.125	155.6	6.349	.086	.312	6.297	.094	.090
226	6.250	158.9	6.474	.086	.312	6.422	.094	.090
227	6.299	160.0	6.524	.086	.312	6.471	.094	.090
228	6.375	162.0	6.601	.086	.312	6.547	.094	.090
229	6.500	165.1	6.726	.086	.312	6.672	.094	.090
230	6.625	168.3	6.863 + .055	.086	.312	6.807	.094	.095
231	6.692	170.0	6.931 - .000	.086 ± .004	.312	6.874	.094	.095
232	6.750	171.4	6.987	.086	.312	6.932	.094	.095
233	6.875	174.6	7.114	.086	.312	7.057	.094	.095
234	7.000	177.8	7.239	.086	.312 + 0.004	7.182	.094	.095
235	7.086	180.0	7.337	.086	.312 - 0.008	7.278	.094	.100
236	7.125	181.0	7.376	.086	.312	7.317	.094	.100
237	7.250	184.1	7.501	.086	.312	7.442	.094	.100
238	7.375	187.3	7.628	.086	.312	7.567	.094	.100
239	7.480	190.0	7.734	.086	.312	7.672	.094	.100
240	7.500	190.5	7.754	.086	.312	7.692	.094	.100
241	7.625	193.7	7.890	.086	.312	7.827	.094	.105
242	7.750	196.8	8.014	.086	.312	7.952	.094	.105
243	7.875	200.0	8.131	.086	.312	8.077	.094 + .006	.105
244	8.000	203.3	8.266	.086	.312	8.202 ± .008	.094 - .000	.105
245	8.250	209.5	8.528	.086	.375	8.462	.094	.110
246	8.267	210.0	8.548	.086	.375	8.479	.094	.110
247	8.464	215.0	8.744	.086	.375	8.676	.094	.110
248	8.500	216.0	8.780 + .065	.086	.375	8.712	.094	.110
249	8.780	222.2	9.041 - .000	.086	.375	8.972	.094	.115
250	8.858	225.0	9.161	.086	.375	9.090	.094	.115
251	9.000	229.8	9.293	.086	.375	9.228	.094	.115
252	9.085	230.0	9.359	.086	.375	9.287	.094	.120
253	9.250	235.0	9.555	.086	.375	9.482	.094	.120
254	9.448	240.0	9.755	.086	.375	9.680	.094	.120
255	9.500	241.0	9.806	.086	.375	9.732	.094	.120
256	9.750	247.8	10.068	.086	.375	9.992	.094	.125
257	10.000	254.0	10.320	.086	.375	10.242	.094	.125
258	10.250	260.8	10.582	.086	.375	10.502	.094	.130
259	10.500	265.0	10.834	.086	.375	10.752	.094	.130
260	10.750	273.0	11.085	.086	.375	11.012	.094	.135
261	11.000	279.6	11.347	.086	.375	11.262	.094	.135

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*Table IV

TYPE B, CLASS 2 RETAINING RINGS

Dash no.	A HOUSING DIAMETER		RING DIMENSIONS			GROOVE DIMENSIONS		
	Inches	mm	Free Diameter B	Thickness C	Radial Wall D	Diameter E	Width F	Nominal Groove Depth G
100	.500	12.7	.538	.035	.045	.530	.039	.015
101	.512	13.0	.550	.035	.045	.542	.039	.015
102	.562	14.3	.605	.035	.055	.596 ± .002	.039	.017
103	.625	15.9	.675	.035	.056	.665	.039	.020
104	.688	17.5	.743	.035	.065	.732	.039	.022
105	.750	19.0	.807	.035	.065	.796	.039	.023
106	.777	19.7	.836	.042	.075	.825	.046 ± .003	.024
107	.812	20.6	.873	.042	.075	.862	.046 - .000	.025
108	.866	22.0	.931	.042	.075	.920	.046	.027
109	.875	22.2	.943	.042	.085	.931	.046	.028
110	.901	22.9	.972 ± .013	.042 ± .002	.085	.959 ± .003	.046	.029
111	.938	23.8	1.013 - .000	.042	.085	1.000	.046	.031
112	1.000	25.4	1.080	.042	.085	1.066	.046	.033
113	1.023	26.0	1.105	.042	.085	1.091	.046	.034
114	1.062	27.0	1.138	.050	.103	1.130	.056	.034
115	1.125	28.6	1.205	.050	.103	1.197	.056	.036
116	1.188	30.2	1.271	.050	.103	1.262	.056	.037
117	1.250	31.7	1.339	.050	.103	1.330	.056	.040
118	1.312	33.3	1.406	.050	.118 ± 0.003	1.386 ± .004	.056	.042
119	1.375	34.9	1.471	.050	.118	1.461	.056	.043
120	1.439	36.5	1.539	.050	.118 - 0.005	1.528	.056	.045
121	1.456	37.0	1.559	.050	.118	1.548	.056 ± .004	.045
122	1.500	38.1	1.605	.050	.118	1.594	.056 - .000	.047
123	1.562	39.6	1.675	.062	.128	1.658	.068	.048
124	1.625	41.2	1.742	.062	.128	1.725	.068	.050
125	1.653	42.0	1.772	.062	.128	1.735	.068	.051
126	1.688	42.8	1.810	.062	.128	1.792	.068	.052
127	1.750	44.4	1.876 ± .020	.062	.128	1.856 ± .005	.068	.054
128	1.812	46.0	1.940 - .000	.062	.128	1.922	.068	.055
129	1.850	47.0	1.981	.062	.158	1.962	.068	.056
130	1.875	47.6	2.008	.062	.158	1.989	.068	.057
131	1.938	49.2	2.075	.062	.158	2.056	.068	.059
132	2.000	50.8	2.142	.062	.158	2.122	.068	.061
133	2.062	52.3	2.201	.078	.168	2.186	.086	.062
134	2.125	53.9	2.267	.078 ± .003	.168	2.251	.086	.063
135	2.188	55.5	2.334	.078	.168	2.318	.086	.065
136	2.250	57.1	2.399 ± .025	.078	.168	2.382	.086	.066
137	2.312	58.7	2.467 - .000	.078	.200	2.450	.086	.069
138	2.375	60.3	2.535	.078	.200	2.517 ± .006	.086 ± .005	.071
139	2.440	61.9	2.602	.078	.200 ± 0.004	2.584	.086 - .000	.072
140	2.500	63.5	2.667	.078	.200	2.648	.086	.074
141	2.531	64.2	2.700	.078	.200	2.681	.086	.075
142	2.562	65.0	2.733	.093	.225 - 0.006	2.714	.103	.076
143	2.625	66.6	2.801	.093	.225	2.781	.103	.078
144	2.688	68.2	2.868	.093	.225	2.848	.103	.080
145	2.750	69.8	2.934 ± .030	.093	.225	2.914	.103	.082
146	2.813	71.4	3.001 - .000	.093	.225	2.980	.103	.084
147	2.834	71.9	3.027	.093	.225	3.006	.103	.085
148	2.875	73.0	3.072	.093	.225	3.051	.103	.086
149	3.000	76.1	3.204	.093	.225	3.182	.103	.091
150	3.082	77.7	3.371 ± .035	.111	.281	3.248	.120	.093
151	3.125	79.3	3.333 - .000	.111	.281	3.315	.120	.095

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*Table IV (Continued)

Dash no.	A HOUSING DIAMETER		RING DIMENSIONS			GROOVE DIMENSIONS		
	Inches	mm	Free Diameter B	Thickness C	Radial Wall D	Diameter E	Width F	Nominal Groove Depth G
152	3.157	80.1	3.371	.111	.281	3.348	.120	.090
153	3.250	82.5	3.470	.111	.281	3.446	.120	.098
154	3.346	85.0	3.571	.111	.281	3.546	.120	.100
155	3.469	86.0	3.701	.111	.281 + 0.004	3.675	.120	.103
156	3.500	88.8	3.736	.111	.281	3.710	.120	.105
157	3.543	89.9	3.781	.111	.281 - 0.006	3.753	.120	.106
158	3.562	90.4	3.802	.111	.281	3.776	.120	.107
159	3.625	92.4	3.868 + .035	.111 + .003	.281	3.841 + .006	.120 + .005	.108
160	3.750	95.2	4.002 - .000	.111	.312	3.974	.120 - .000	.112
161	3.875	98.3	4.136	.111	.312	4.107	.120	.116
162	3.938	99.9	4.203	.111	.312	4.174	.120	.118
163	4.000	101.5	4.270	.111	.312	4.240	.120	.120
164	4.215	104.7	4.369	.111	.312	4.339	.120	.107
165	4.250	107.9	4.501	.111	.312	4.470	.120	.110
166	4.330	109.9	4.588	.111	.312	4.556	.120	.112
167	4.500	114.2	4.768	.111	.312	4.733	.120	.117
168	4.625	117.4	4.899	.111	.312	4.865	.120	.120
169	4.750	120.6	5.030	.111	.312	4.995	.120	.122
170	5.000	126.9	5.297	.111	.312	5.260	.120	.136
171	5.250	133.2	5.559	.127	.350	5.520	.139	.135
172	5.375	136.4	5.690	.127	.350	5.650	.139	.135
173	5.500	139.6	5.810 + .050	.127 ± .004	.350	5.770 + .007	.139 + .006	.135
174	5.750	145.9	6.062 - .000	.127	.350 + 0.004	6.020	.139 - .000	.135
175	6.000	152.3	6.314	.127	.350	6.270	.139	.135
176	6.250	158.6	6.576	.156	.380 - 0.008	6.530	.174	.140
177	6.500	165.0	6.838 + .055	.156	.380	6.790	.174	.145
178	6.625	168.1	6.974 - .000	.156	.380	6.925	.174	.150
179	6.750	171.3	7.105	.156	.380	7.055	.174	.152
180	7.000	177.7	7.366	.156	.380	7.315	.174	.157
181	7.250	184.0	7.628	.187	.418	7.575	.209	.162
182	7.500	190.5	7.895	.187	.418	7.840	.209	.170
183	7.750	197.0	8.157	.187	.418	8.100	.209	.175
184	8.000	203.3	8.419	.187	.418	8.360 + .008	.209	.180
185	8.250	209.8	8.680	.187	.437	8.620	.209	.185
186	8.500	216.0	8.942	.187	.437	8.880	.209	.190
187	8.750	222.2	9.209 + .070	.187	.437	9.145	.209	.197
188	9.000	228.8	9.471 - .000	.187	.437	9.405	.209	.202
189	9.250	235.0	9.737	.187	.437	9.669	.209	.202
190	9.500	241.5	10.000	.187	.500	9.930	.209	.215
191	9.750	248.0	10.260	.187	.500	10.189	.209	.215
192	10.000	254.0	10.523	.187 ± .005	.500	10.450	.209	.225
193	10.250	260.6	10.786	.187	.500	10.711	.209 + .008	.230
194	10.500	266.7	11.047	.187	.500	10.970	.209 - .000	.235
195	10.750	273.1	11.313	.187	.500	11.234	.209	.242
196	11.000	279.4	11.575	.187	.500	11.495	.209	.247
197	11.250	285.8	11.838 + .120	.187	.500 + 0.006	11.756	.209	.253
198	11.500	292.1	12.102 - .000	.187	.562	12.018 ± .010	.209	.259
199	11.750	298.5	12.365	.187	.562 - 0.008	12.279	.209	.264
200	12.000	304.8	12.628	.187	.562	12.540	.209	.270
201	12.250	311.2	12.891	.187	.562	12.801	.209	.275
202	12.500	317.5	13.154	.187	.562	13.063	.209	.281
203	12.750	323.9	13.417	.187	.562	13.324	.209	.287
204	13.000	330.2	13.680	.187	.662	13.585	.209	.292
205	13.250	336.6	13.943	.187	.662	13.846	.209	.298
206	13.500	342.9	14.207	.187	.662	14.108	.209	.304
207	13.750	349.3	14.470 + .140 - .000	.187	.662	14.369 + .012	.209	.309
208	14.000	355.6	14.732	.187	.662	14.630	.209	.315
209	14.250	362.0	14.995	.187	.662	14.891	.209	.320
210	14.500	368.3	15.259	.187	.750	15.153	.209	.326
211	14.750	374.7	15.522	.187	.750	15.414	.209	.332
212	15.000	381.0	15.785	.187	.750	15.675	.209	.337

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3.4.3 **Crimp.** Unless otherwise specified in the contract or order, retaining rings shall be crimped. (See Figure 3.)



Figure 3. Crimped Retaining Rings

3.4.3.1 **Crimp height.** The height of the crimp (see Figure 4) shall be equal to the thickness of the ring within the following tolerances:

Ring thickness (C) (inch)	Tolerance (inch)
0.000 - 0.044	± 0.002
0.045 - 0.066	± 0.003
0.067 and over	± 0.005

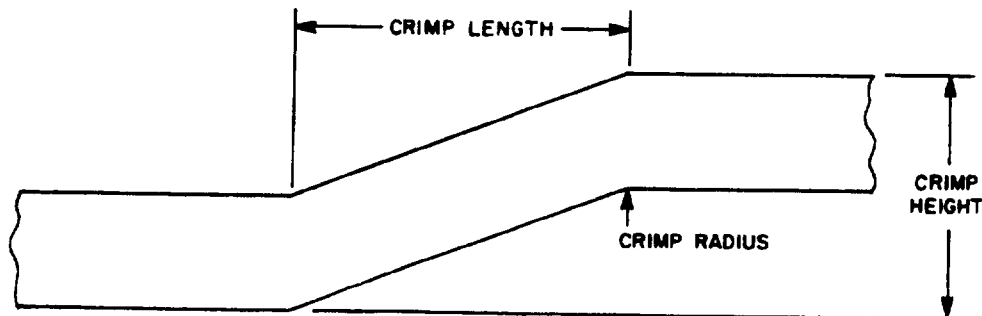


Figure 4. Crimp

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3.4.3.2 Crimp length and radius. The crimp length and crimp radius (see Figure 4) shall conform to the following dimensions and tolerances as applicable:

Material thickness (C/2) (inch)	Material width (D) (inch)	Crimp length (max) (inch)	Crimp radius (min) (inch)
0.000 - 0.021	0.000 - 0.250	0.095	0.015
0.022 - 0.031	0.000 - 0.250	0.130	0.015
0.032 and over	0.000 - 0.250	0.190	0.015
All thicknesses	0.250 and over	0.250	0.031

*3.4.4 Dish. The dish shall be considered the height difference in the ring cross section's axis of symmetry between the O.D. and I.D. as illustrated in figure 5 below. Retaining rings shall be rolled flat within a maximum allowable dish of 0.005 inch for rings up to 2.000-inch ring size and 0.010 for rings over 2.000-inch ring size.

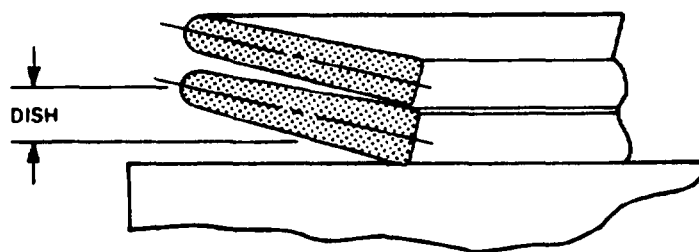


Figure 5. Dish

*3.4.5 Misalignment. Each coil of the retaining ring shall lie in line (be concentric) with each other within a maximum misalignment (see Figure 6) of 0.025 inch for rings up to and including 2.000-inch ring size, 0.050 inch for rings up to and including 6.000-inch ring size, and 0.075 for rings over 6.000-inch ring size.



Figure 6. Misalignment

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*3.4.6 **Distortion.** The maximum cumulative allowable distortion and kink in retaining rings (see Figure 7) shall not exceed the following dimensional values as applicable.

<u>Ring size</u> <u>(inch)</u>	<u>Kink and distortion</u> <u>(maximum) (inch)</u>
0.000 - 1.000	0.006
1.001 - 3.000	0.010
3.001 and over	0.015

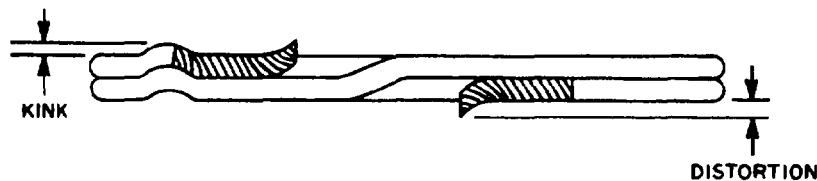


Figure 7. Distortion

3.4.7 **Notches and slots.** All rings shall be either notched or slotted in accordance with 3.4.7.1 and 3.4.7.2 to facilitate removal of the rings from the grooves, using a screwdriver or similar common type tool. Special removal tools shall not be required. Ring sizes 2.750 inches and smaller shall be notched. Unless specified in contract or order, ring sizes 2.812 inches and larger may be notched or slotted at the option of the manufacturer.

*3.4.7.1 **Notches.** Notches in the rings shall be similar to Figure 8 for Type A or Type B rings as applicable. Dimension "X" in Figure 8 shall be equal to or greater than $D/3$, but not to exceed $D/2$. Radius "R" shall be any convenient radius between 1/16 inch and 1 inch, depending on the size of the ring, which will permit insertion into the notch (when the ring is installed in its groove) of a removal tool of sufficient size and strength to remove the ring from its groove.

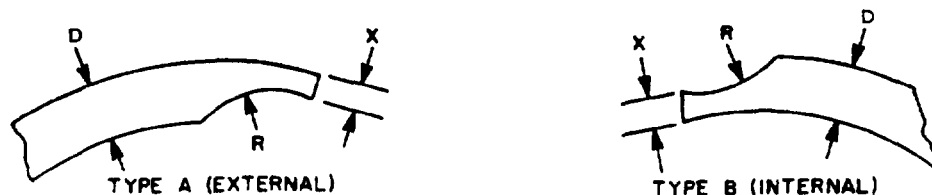


Figure 8. Notches

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*3.4.7.2 Slots. Slots in the rings shall be similar to Figure 9 and be dimensionally proportioned to the size of the ring furnished. The length, width, and location of the slots shall be adequate for the removal of the ring from its proper groove, and there shall be one on each end.

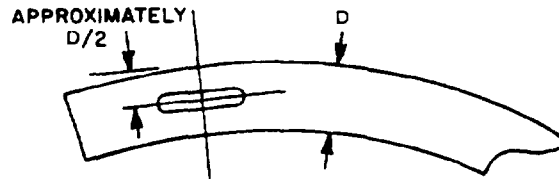


Figure 9. Slots

3.4.8 Edges. The edges of the ring material shall be rounded. The rounded edges shall be regular, uniform, and smooth and shall be free from dents, nicks, cracks, burrs, and other irregularities.

3.5 Performance. Retaining rings furnished under this specification shall be capable of withstanding the performance test of 4.3.2.2.

3.6 Workmanship. Workmanship shall be of a quality which will insure compliance with all the requirements of this specification. Each retaining ring shall be free from hanging burrs and slivers, gouges, porosity, cracks, objectionable scale, or any other defects which may adversely affect the rings' serviceability.

4. QUALITY ASSURANCE PROVISIONS

*4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

*4.2 Sampling.

*4.2.1 Lot. A lot shall consist of all the retaining rings of the same type, class, size, material, and finish manufactured under essentially the same conditions for acceptance inspection.

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*4.2.2 For quality conformance examination. Sample retaining rings, packages, and shipping containers shall be selected from each lot in accordance with MIL-STD-105, inspection level II for examination in accordance with 4.3.1.

*4.2.3 For quality conformance tests. Sample retaining rings shall be selected from each lot in accordance with MIL-STD-105, inspection level S-3 for testing in accordance with 4.3.2.

*4.3 Inspection.

*4.3.1 Quality conformance examination. Sample retaining rings selected in accordance with 4.2.2 shall be visually and dimensionally examined to verify compliance with the requirements of the contract or order and this specification. The rings shall be accepted or rejected in accordance with the requirements of MIL-STD-105, using an AQL of 4.0 except that the free diameter of the retaining rings shall be judged using an AQL of 1.0.

*4.3.2 Tests.

*4.3.2.1 Quality conformance test. Retaining rings selected in accordance with 4.2.3 shall be tested as specified in 4.3.2.2 and 4.3.2.3 in accordance with the requirements of MIL-STD-105 using an AQL of 1.0.

*4.3.2.2 Performance test. Prior to the hardness test of 4.3.2.3, each retaining ring of the sample selected in accordance with 4.2.2 shall be subjected to a performance test. All types and classes of retaining rings shall be inserted and removed a minimum of five times from grooves conforming to the dimensions and tolerance of the grooves for which the rings were designed. Upon completion of the test, each retaining ring shall be visually and dimensionally checked. Any indications of cracks, excessive permanent set or distortion, or other defects shall be cause for rejection. Distortion or permanent set which takes place when the ring is expanded or compressed by 10 percent of the free diameter shall be cause for rejection.

4.3.2.3 Hardness test. After the performance test of 4.3.2.2 each sample retaining ring shall be tested for conformance of the hardness requirements specified in 3.2. The surfaces of both sides of each sample shall be prepared for hardness testing in such a manner that all plating and other surface conditions have been removed that may affect the hardness readings. Hardness readings shall be taken as close as practicable to the center of the radial width surfaces on each test ring. Rings shall be tested for harness using the test method ASTM E 18.

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4.3.2.4 Protective finish. When retaining rings are furnished with a plating or coating (see 3.3), the thickness of the plating or coating shall be determined in accordance with the applicable plating or coating specification.

* 4.3.2.5 Packaging, packing, and marking. It shall be ascertained that the packaging and packing of the retaining rings and marking of the sample containers, selected in accordance with 4.2.2, are in accordance with this specification (see Section 5).

5. PREPARATION FOR DELIVERY

*5.1 Preservation, packaging, packing, and marking. Unless otherwise specified, retaining rings shall be preserved and packaged level A or C, packed level A, B, or C, and marked, in accordance with the requirements of PPP-H-1581. The level of protection shall be as specified in the contract or order (see 6.3).

6. NOTES

6.1 Intended use. Retaining rings covered by this specification are intended for internal and external retaining applications, such as positioning and retaining bearings and springs in housings and on shafts, and for retaining shafts in housings.

6.2 Design information.

a. DEFINITIONS:

1. A_o = Area of material cross section (in²)
2. C_o = Percent change from free state to max/min diameter during installation/100
3. C_1 = Percent change of ring diameter from free state to installed state/100
4. D_o = Shaft or housing diameter, (in) [equivalent to "A" in tables]
5. D_g = Permanent groove deformation (in)
6. D_n = Ring neutral diameter (in)
7. D_1 = Depth of groove (in) [equivalent to "G" in tables]
8. E_o = Modulus of elasticity (psi)
9. H = Ring radial wall (in) [equivalent to "D" in tables]
10. I = $T_1 H^3/12$
11. K = Factor of safety (approximately 2-3)
12. L = Number of turns of ring
13. N = Speed (rpm)
14. P_c = Thrust load (lbs/inch of circumference)

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15. P_s = Allowable shear load based on shear strength of material (lbs)
 16. P_t = Thrust load (lbs)
 17. R_g = Groove radius (in) [equivalent to $E/2$ from tables]
 18. R_1 = Free inside ring radius (in)
 19. R_n = $D_n/2$ = Free neutral ring radius (in)
 20. R_o = Free outside ring radius (in)
 21. S = Installation stress (psi)
 22. S_c = Shear strength of groove material (psi)
 23. S_s = Shear strength of ring material (psi)
 24. S_y = Yield strength of groove material (psi)
 25. T = Ring thickness (in) [equivalent to "C" in tables]
 26. T_1 = Material thickness (in) [equivalent to $C/2$ from tables]
 27. Y = Distance of groove from end of shaft or housing (in)
 28. σ = Allowable working stress (psi)
 29. ϕ = Allowable angle of inflection (deg)
 30. t_1 = 0.19
 31. t_2 = 0.32
 32. γ = Specific weight of material (in - lbs/in³)
- b. Allowable thrust load capacity of the rings, abutting components to have sharp corners.

$$P_s = \frac{D_o T S_s \pi}{K}$$

- c. Allowable capacity of groove wall.

$$P_t = \frac{\pi D_o D_1 S_y}{K}$$

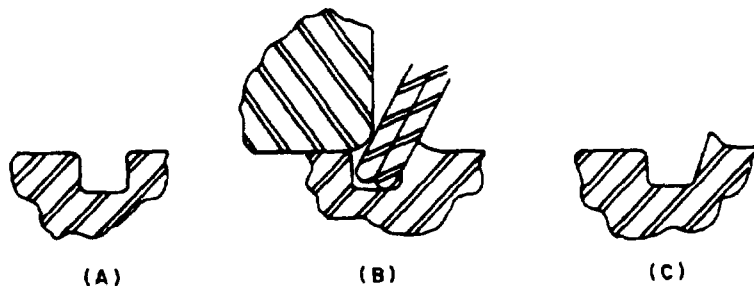
- d. Minimum distance between outer-groove wall and end of shaft.

$$Y = \frac{K P_t}{\pi S_c D_o} \quad \text{see Figures 1 and 2}$$

NOTE: A rough approximation for the minimum distance is $Y = 3D_1$.

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- e. **Axial Deflection:** The maximum stress on a ring, which is subjected to a uniform twisting moment, is a tensile stress that occurs at the inner corner of the ring. This stress makes the ring have a tendency to grow in diameter and become dished. This moment is caused when the compressive yield strength of the groove material is exceeded as illustrated below



Groove displacement is calculated as follows:

$$Dg = \frac{0.073 Pt}{D_o S_y}$$

This equation is valid only if the load is applied through a retained part which applies the load very close to the shaft or bore diameter and where the load is of a static nature. To calculate allowable deflection of the ring the equations are:

for External Rings

$$\phi = 114.6 Rg \left[\frac{\sigma - \frac{C_1 E_o H}{(1 + C_1) D_n}}{E_o T_1} \right]$$

for Internal Rings

$$\phi = 114.6 Rg \left[\frac{\sigma + \frac{C_1 E_o H}{(1 - C_1) D_n}}{L E_o T_1} \right]$$

- f. **Centrifugal Capacity:** Proper functioning of an external retaining ring depends upon the ring remaining seated on the groove bottom. Centrifugal loading can overcome cling of the ring. To calculate allowable steadystate speed of the retaining ring the equation is:

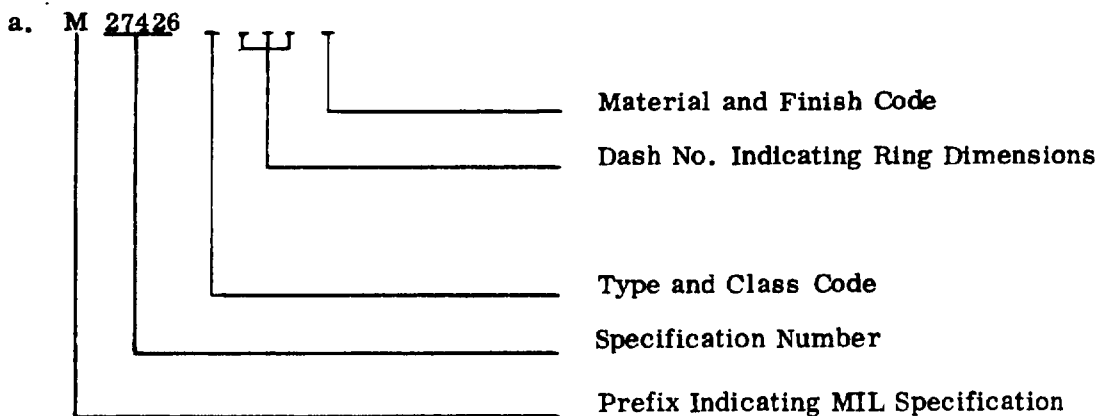
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$$N = \left[\frac{0.48 C_1 H^3 \times 10^{12}}{Rn^3 (1 + C_1) (Ro^3 - R_1^3)} \right]^{1/2}$$

- g. Rotation between Parts: When a spiral ring retains a rotating part, rotation shall be limited to one direction only and to applications involving light thrust loads. The ring is to be wound in the direction of rotation of the rotating part, in the case of external rings, or against the direction of rotation for internal rings. Failure to follow these criteria will cause the ring to wind out of its groove.

6.3 Ordering data. Procurement documents for ordering retaining rings shall use the following Part Numbering technique for identification and ordering. Codes for variable characteristics are as specified below and Dash Numbers are in the tables.

<u>Designation</u>	<u>Code</u>	<u>Item Requirement</u>
Type & Class	1	Type A Class I
	2	Type A Class 2
	3	Type B Class 1
	4	Type B Class 2
Material & Finish	A	Carbon Steel Plain
	B	Carbon Steel Cadmium Plated
	C	Carbon Steel Phosphate Coated
	D	Corrosion Resisting Steel, Passivated
	E	Copper-Beryllium Alloy



EXAMPLE: M 27426-4102B which is: Type B, Class 2, housing diameter of 0.562 inch, Carbon Steel, Cadmium Plated Ring.

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- b. Selection of applicable levels of preservation, packaging, and packing required (see 5.1).

*6.4 Changes to previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:

Army - WC
Navy - OS
Air Force - 82
DISC

Preparing activity:

Navy - OS
(Project no. 5340-0825)

Review interest:

Army - MI, AV, WC
Air Force - 11, 82

User interest:

Army - AT, ME, EL, MU
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